

APEX

Francisco Montenegro

APEX Operations Astronomer



Telescope

Telescope

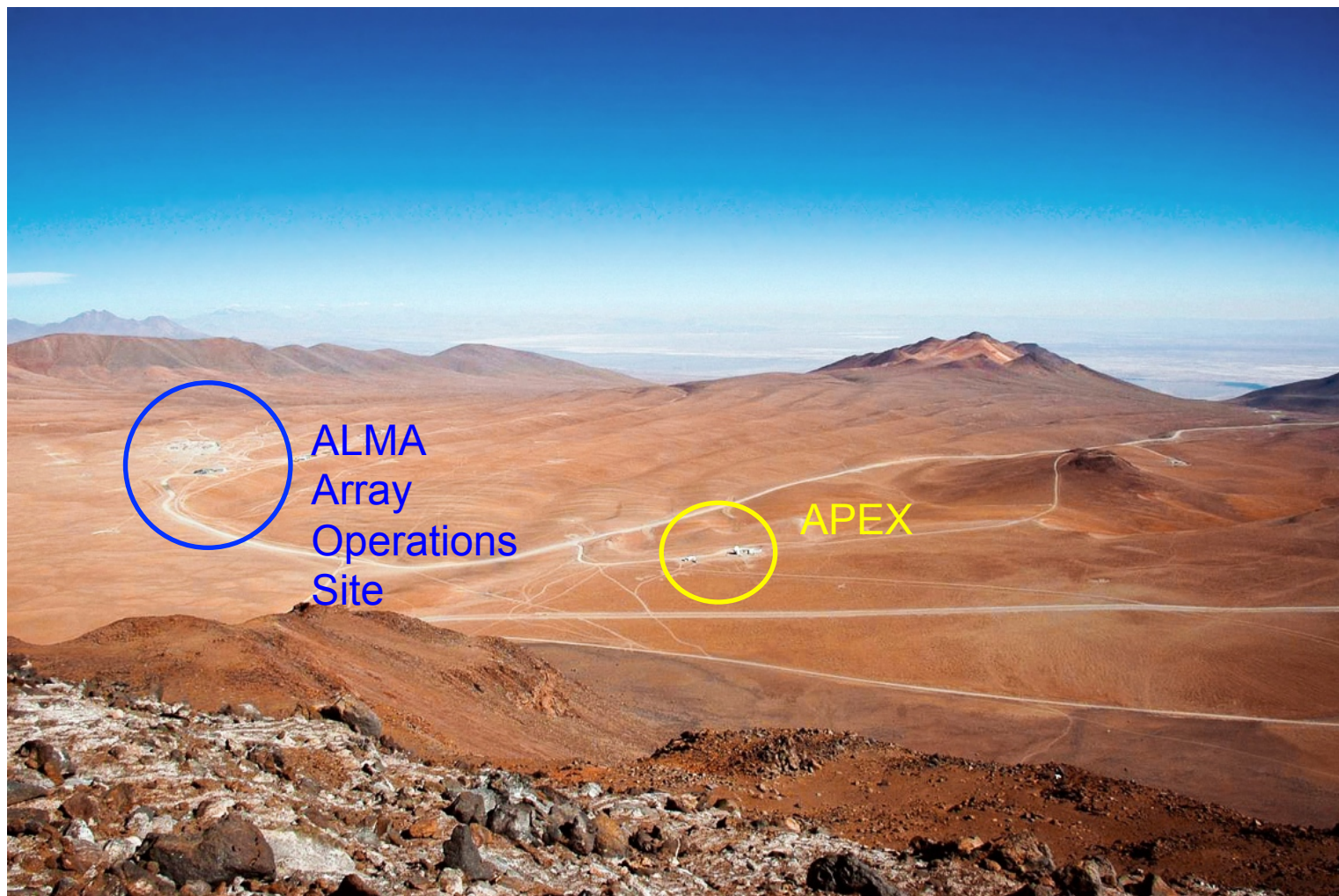
ALMA prototype modified antenna
12-m dish

2 Nasmyth (A,B) + Cassegrain (C)

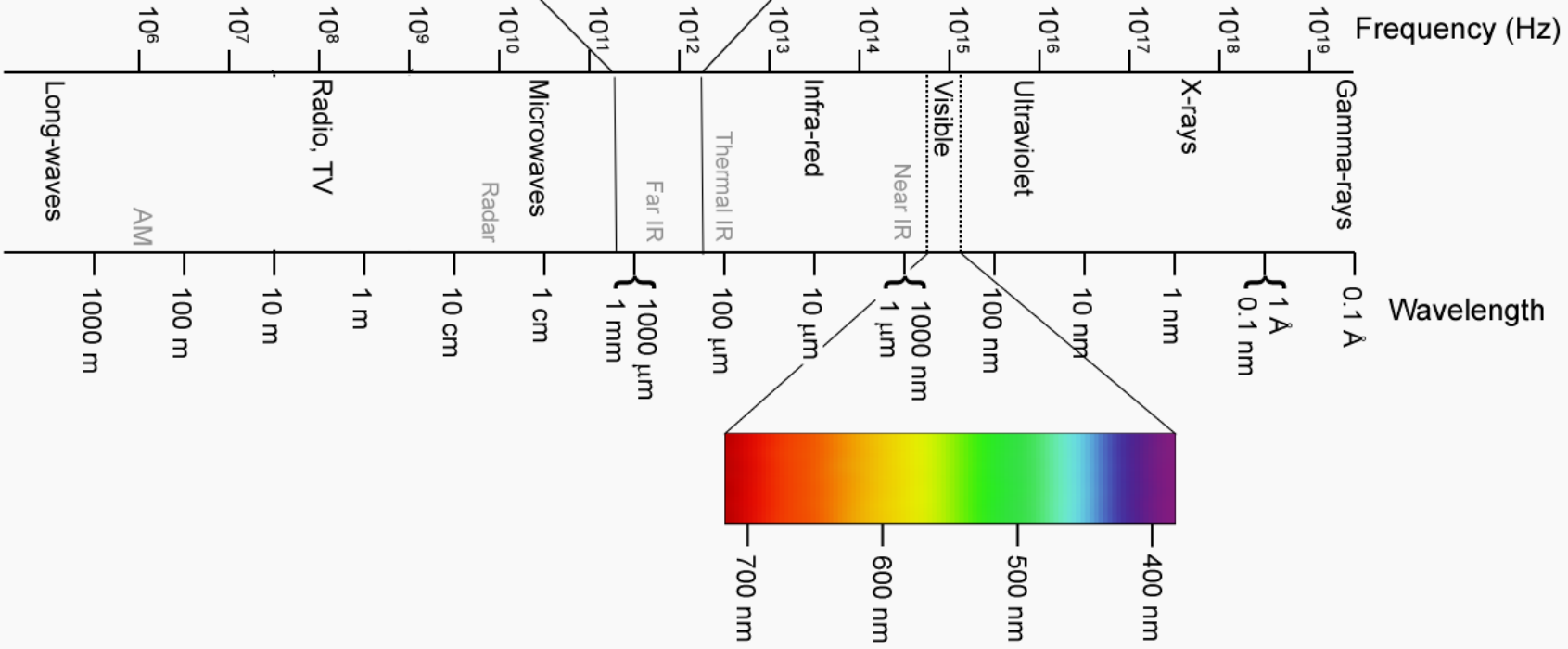
9 instrument positions

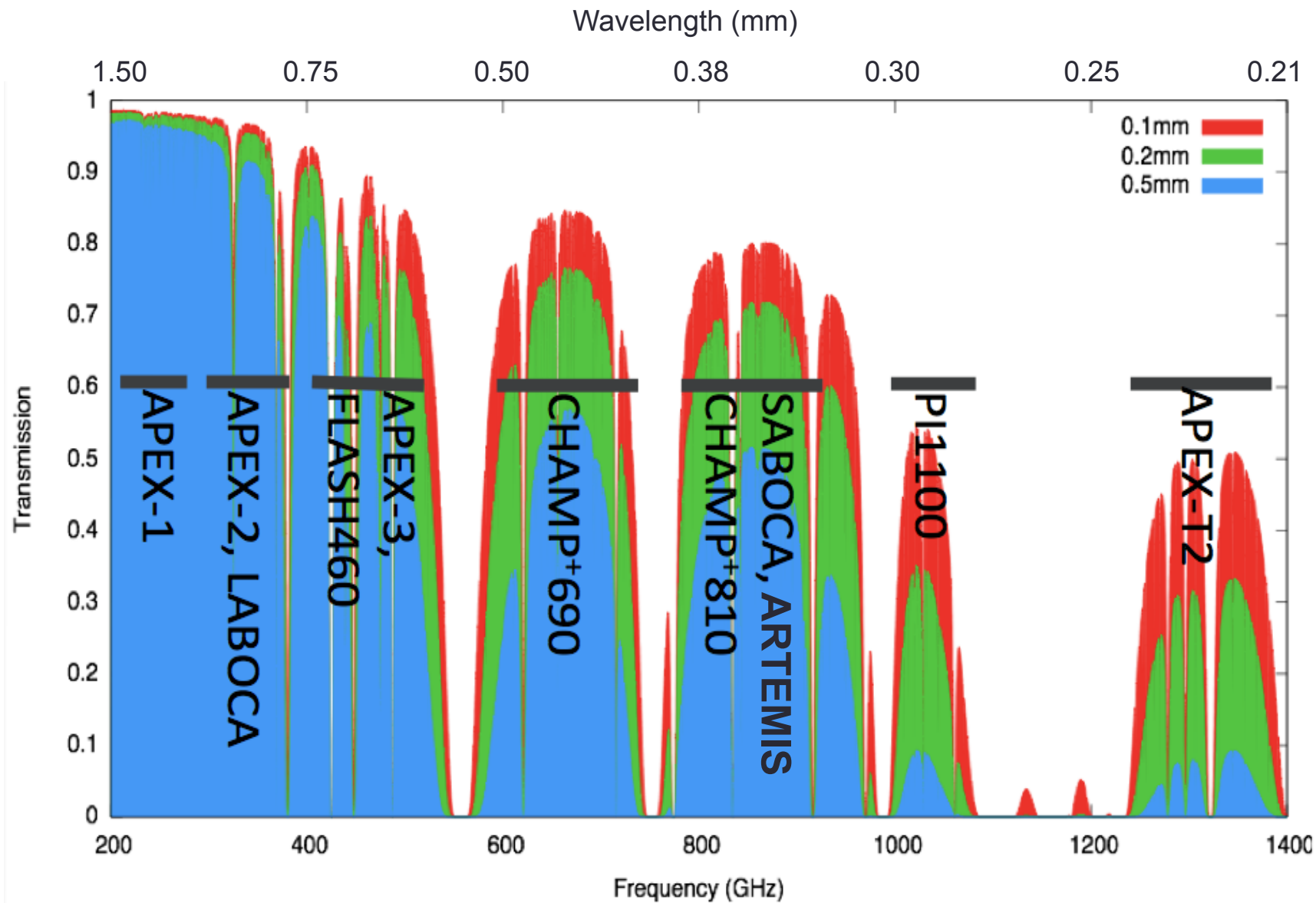


Telescope



APEX instruments
200 – 1400 GHz
1.5 – 0.2 mm

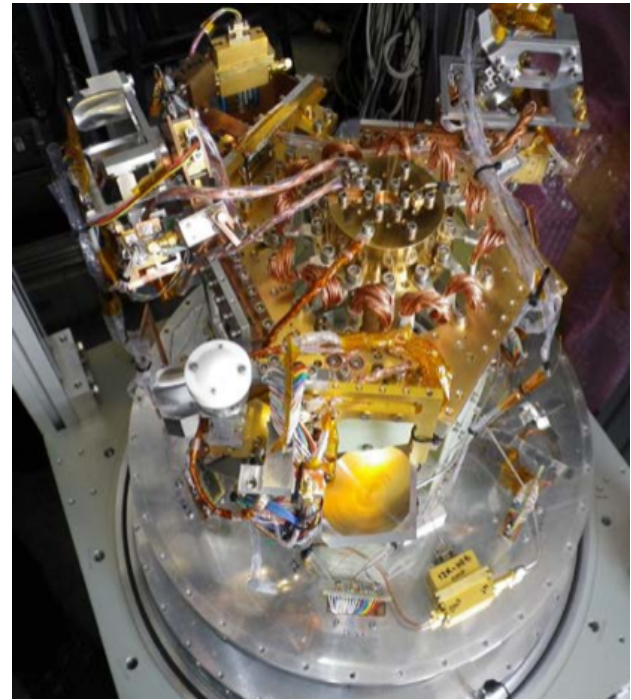
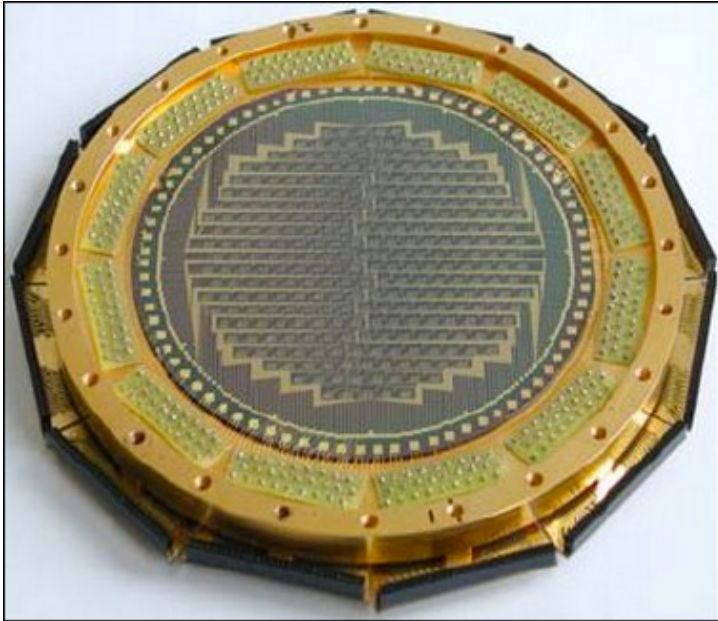




Instruments

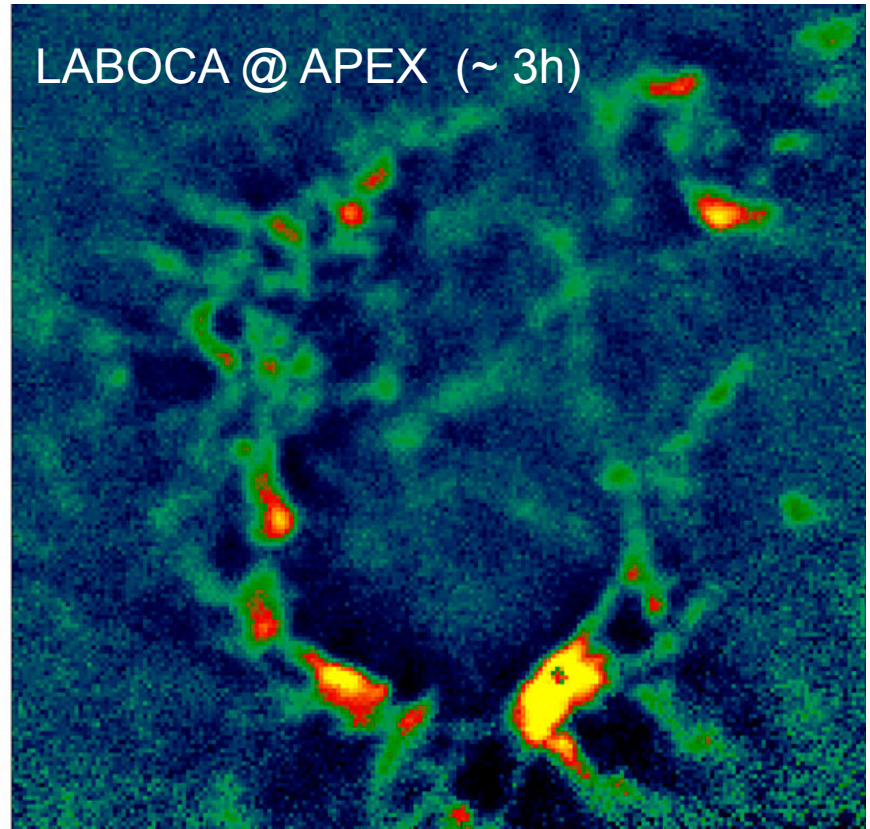
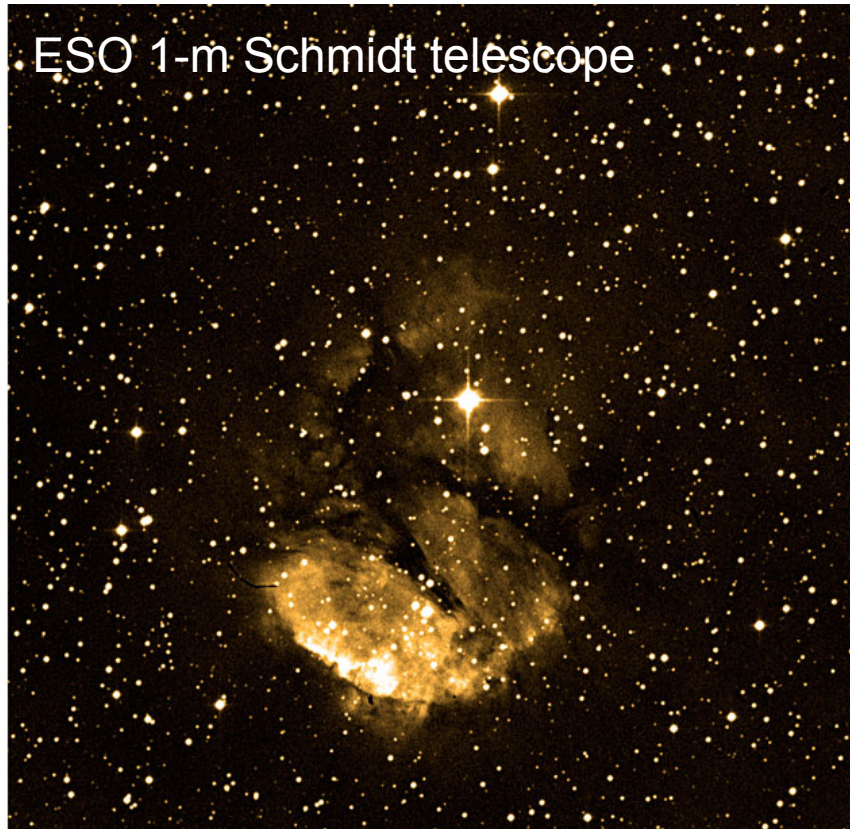
Instruments

- Bolometer arrays
(Imagers or photometers.
Broad band)
- Heterodyne instruments
(Spectrographs. Narrow band)



Instruments

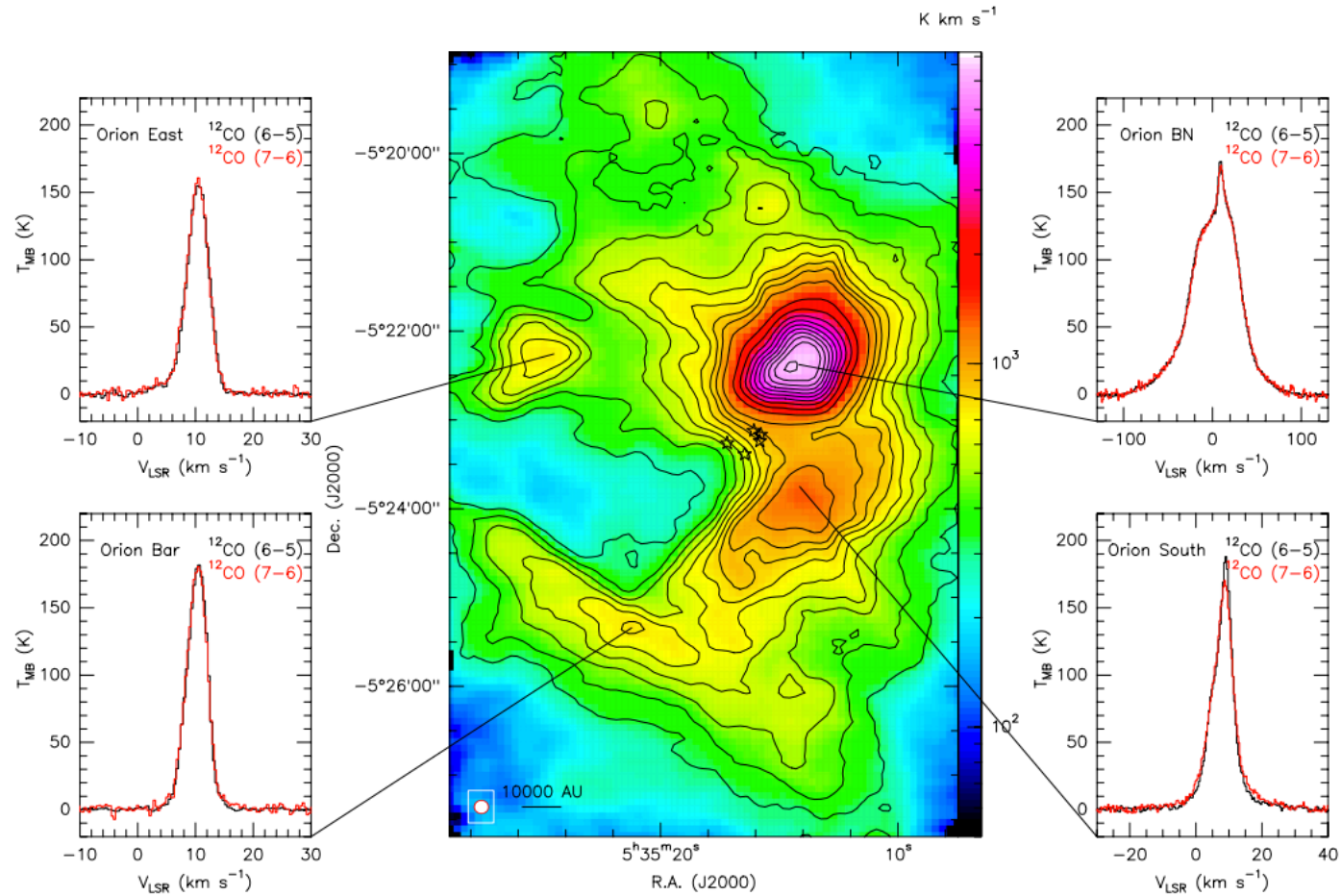
Bolometer cameras



RCW 120 bubble LABOCA@APEX. Deharveng et al. 2009 A&A 496, 177

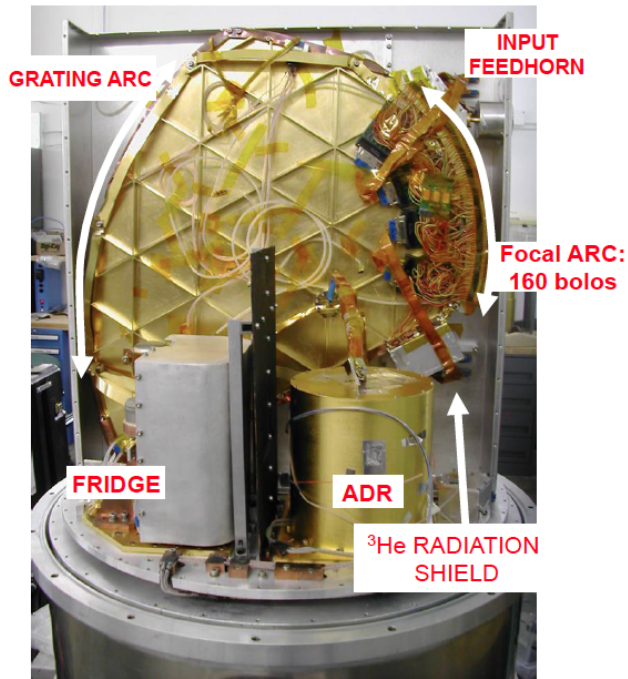
Instruments

Heterodyne instruments

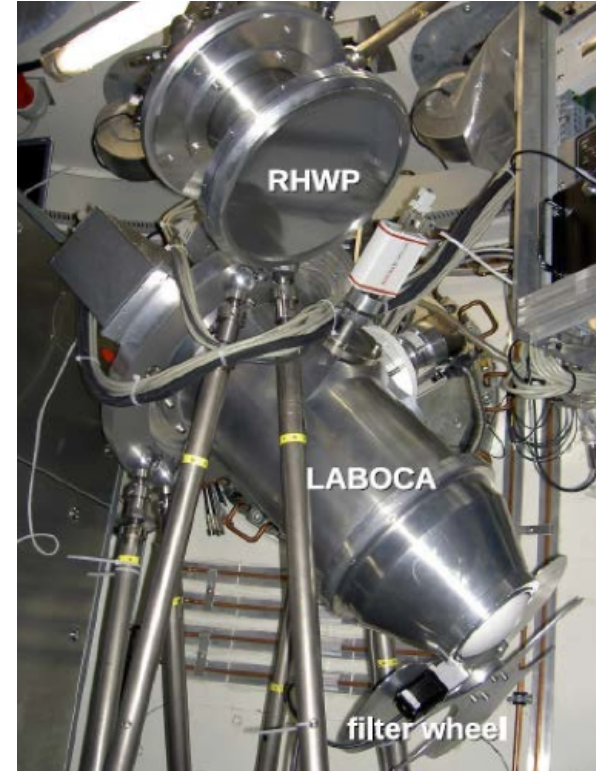


Orion Molecular Cloud 1 with CHAMP+@APEX. Peng et al. 2012 (A&A 538, A12)

Instruments



Bolometer linear array
+
dispersive grating



Bolometer array
+
polarimeter

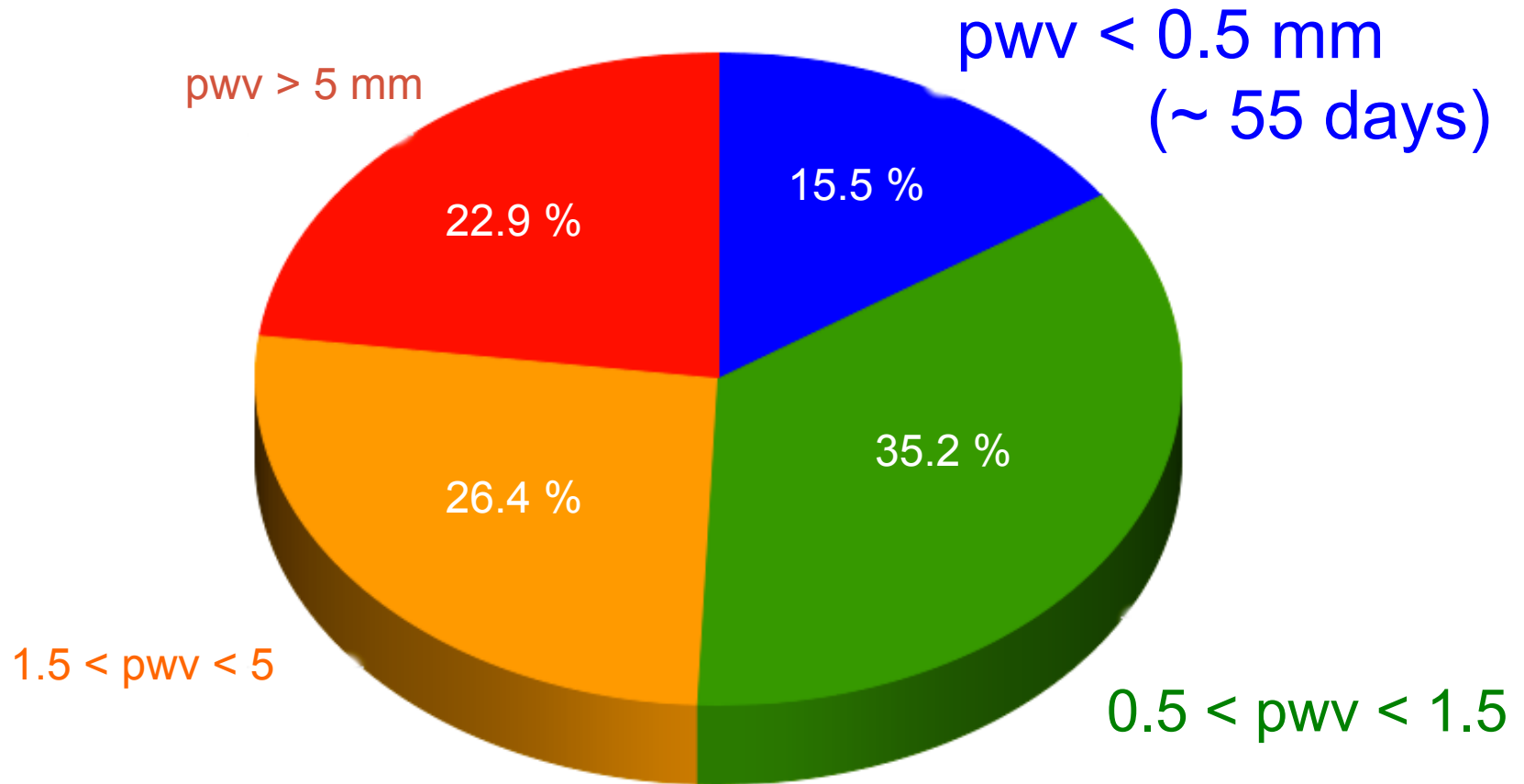
Instruments

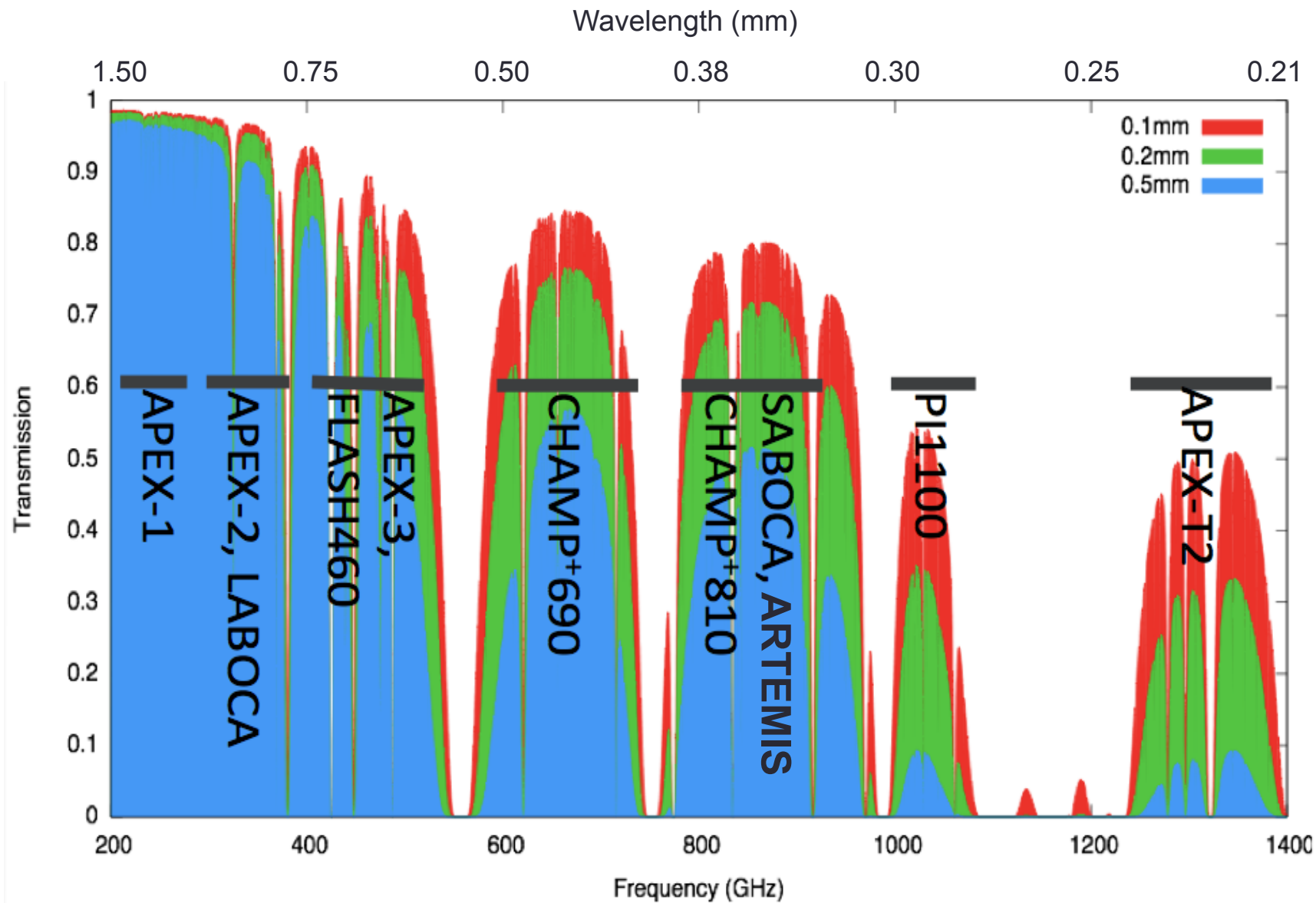
	Facility	PI
Current	LABOCA (MPIfR) (SABOCA) (MPIfR) SHeFI (Onsala)	ArTéMiS (ESO) CHAMP+ (MPIfR) FLASH (MPIfR) PolKa (MPIfR) 1.05-THz Rx (MPIfR) VLBI backend (MPIfR)
Future		A-MKID (MPIfR) LAsMA (MPIfR) ZEUS-2 (MPIfR)

Past: APEX-2a, p-ArTéMiS, ASZCa, Z-Spec, CONDOR

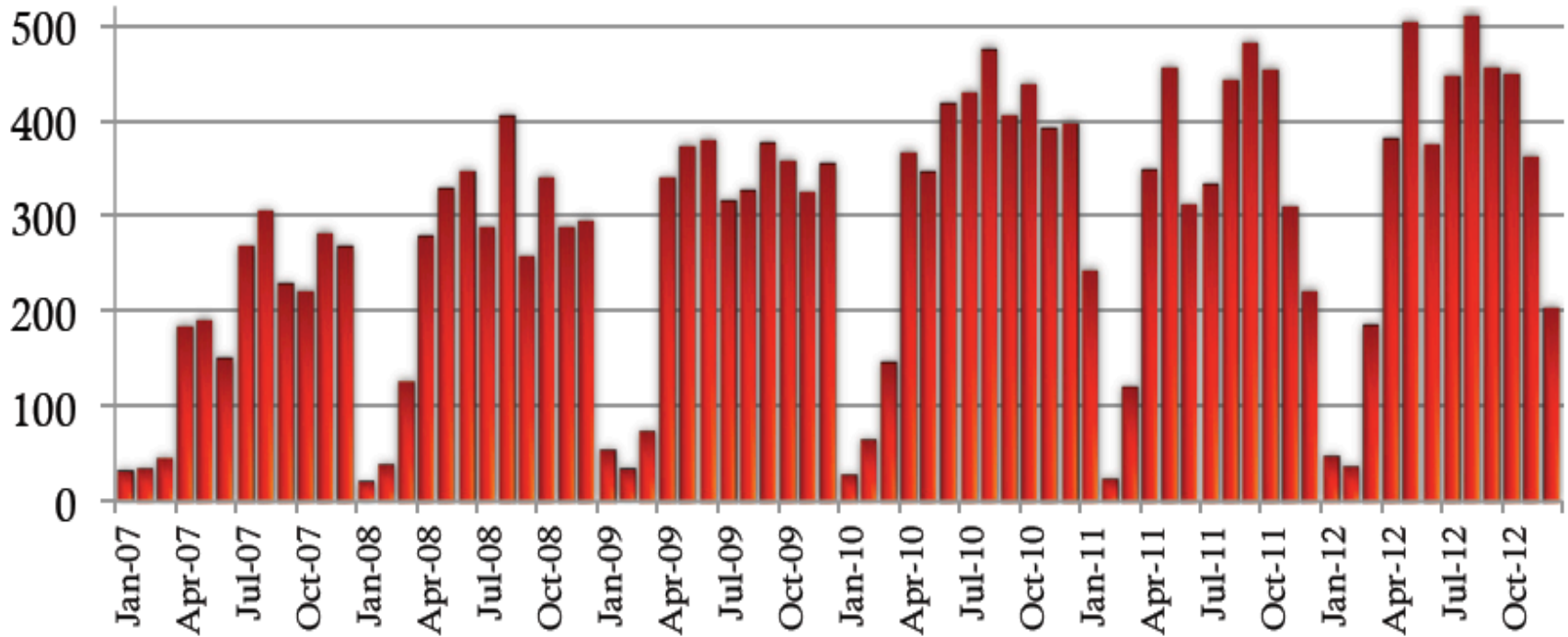
Strengths of APEX

PWV distribution for 2012

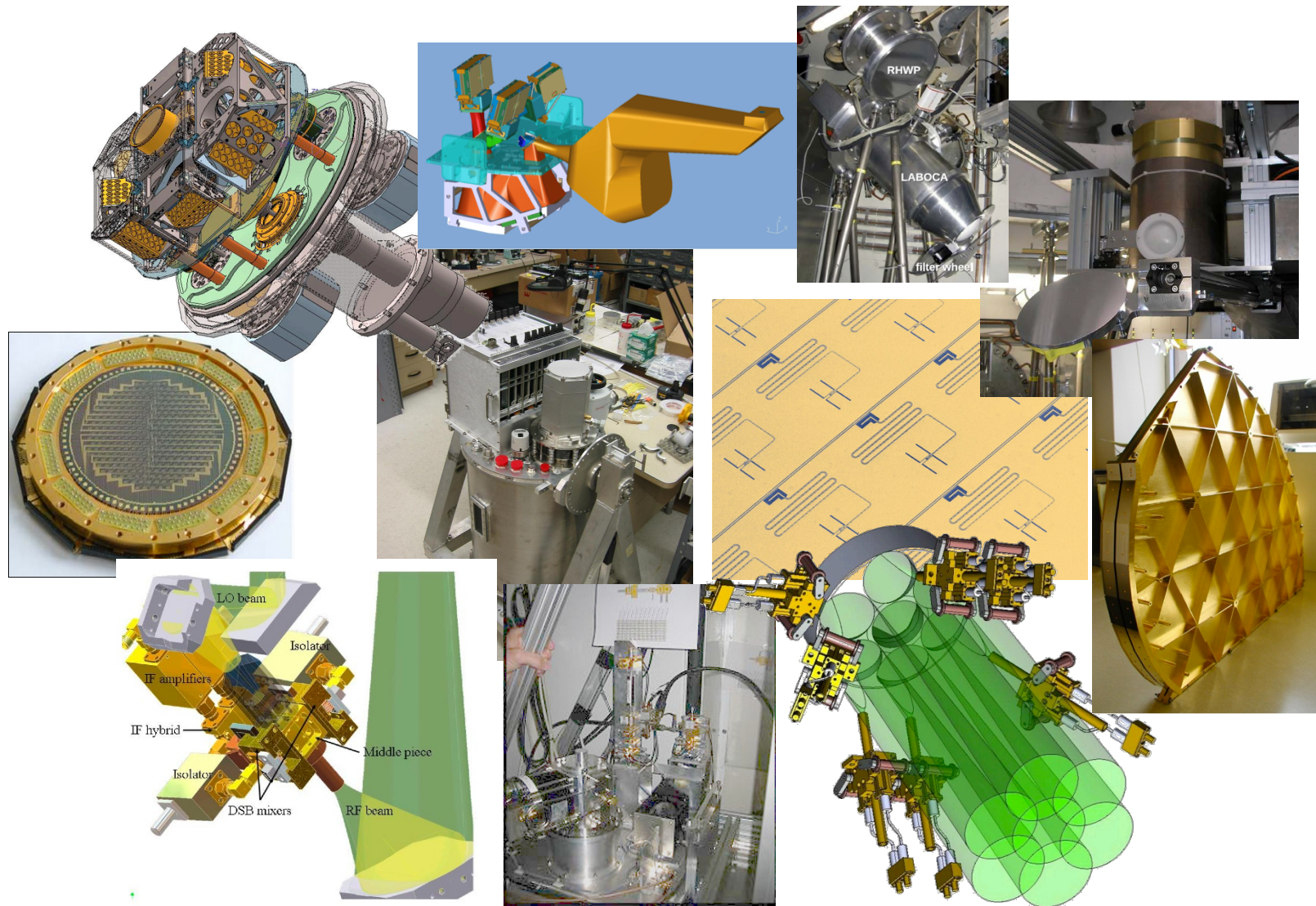




Efficiency



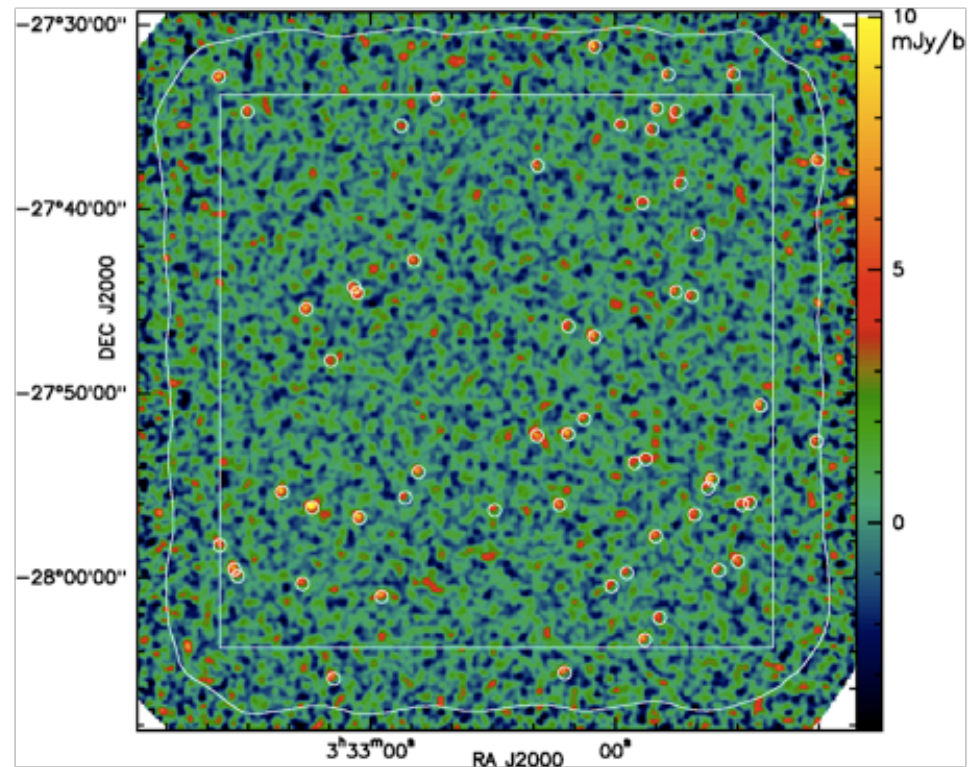
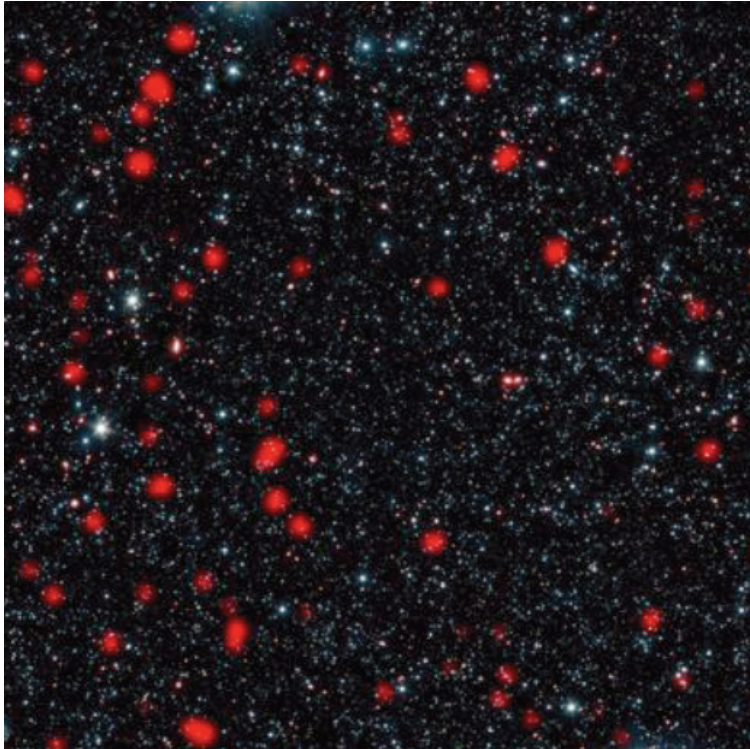
AP(EXperiment)



What science can you do with APEX?

Deep surveys

30 x 30 arcmin
~ 280 hours on-sky



Extended Chandra Deep Field South Survey. Weiß et al. 2009 ApJ 707, 1201

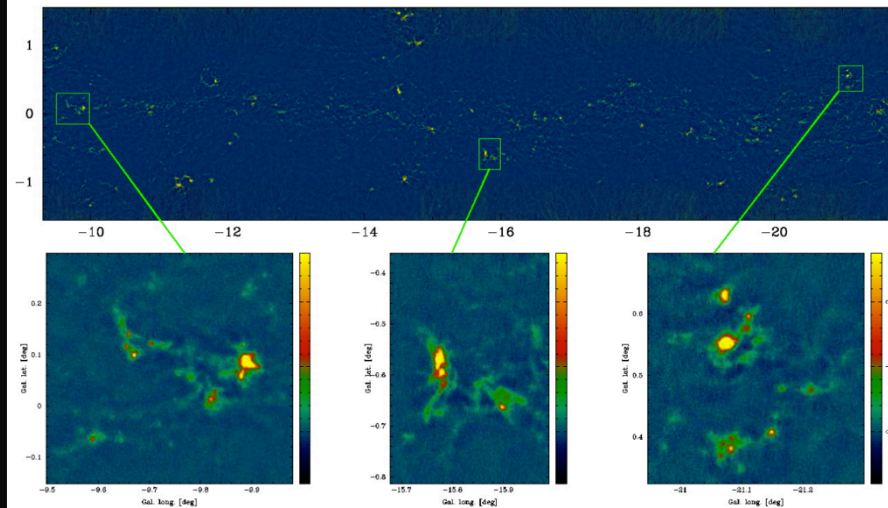
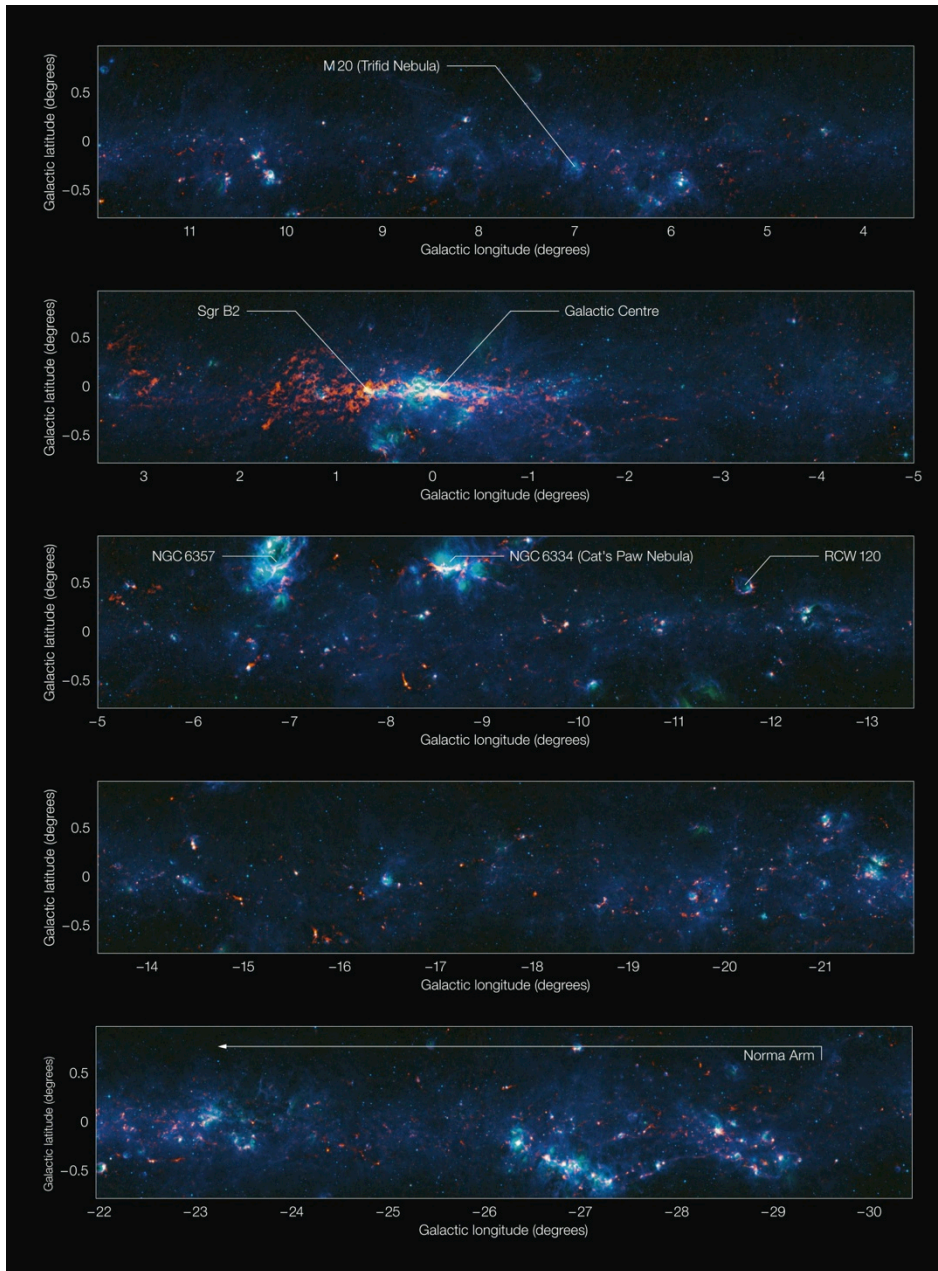
Large Surveys

ATLASGAL

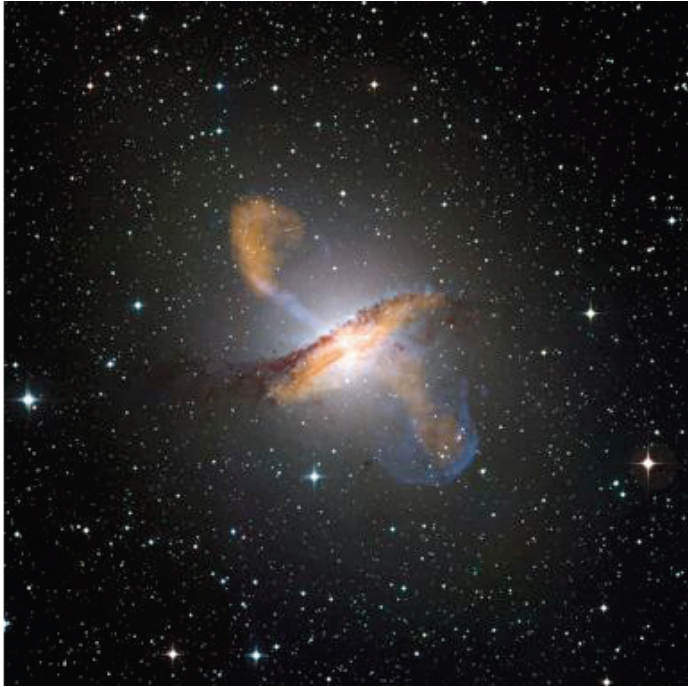
LABOCA survey of the
Galactic Plane

~ 400 deg²
~ 50 mJy rms

Schuller et al. 2009 A&A 504, 415

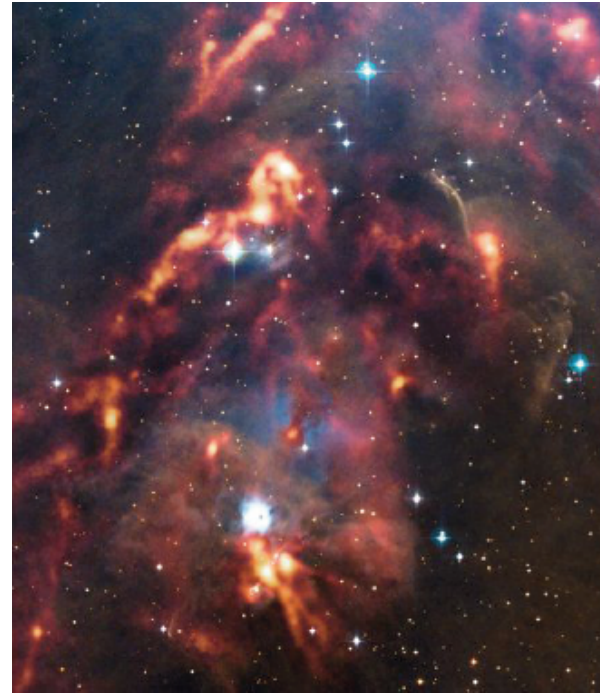


Map your favorite objects



Centaurus A

Weiß et al. 2008 A&A 490, 97



Orion

Stutz et al. 2013 ApJ 767, 36

Variability studies: Galactic center

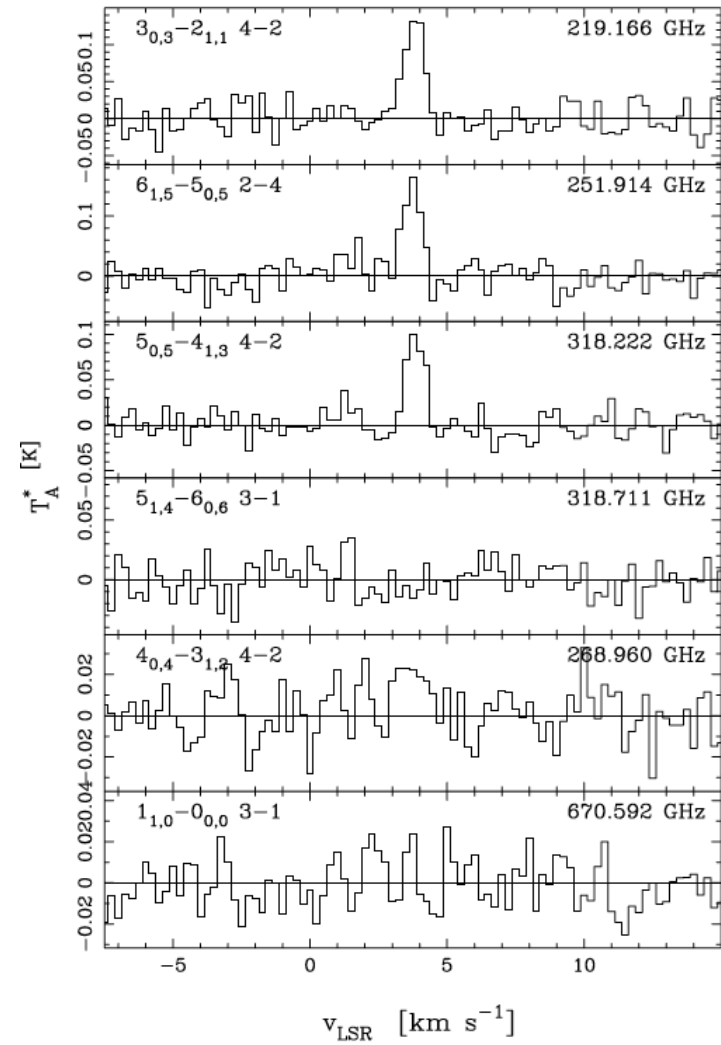


*Flare emission in Sagittarius A**. Eckart et al. 2008, A&A 492, 337

Astrochemistry

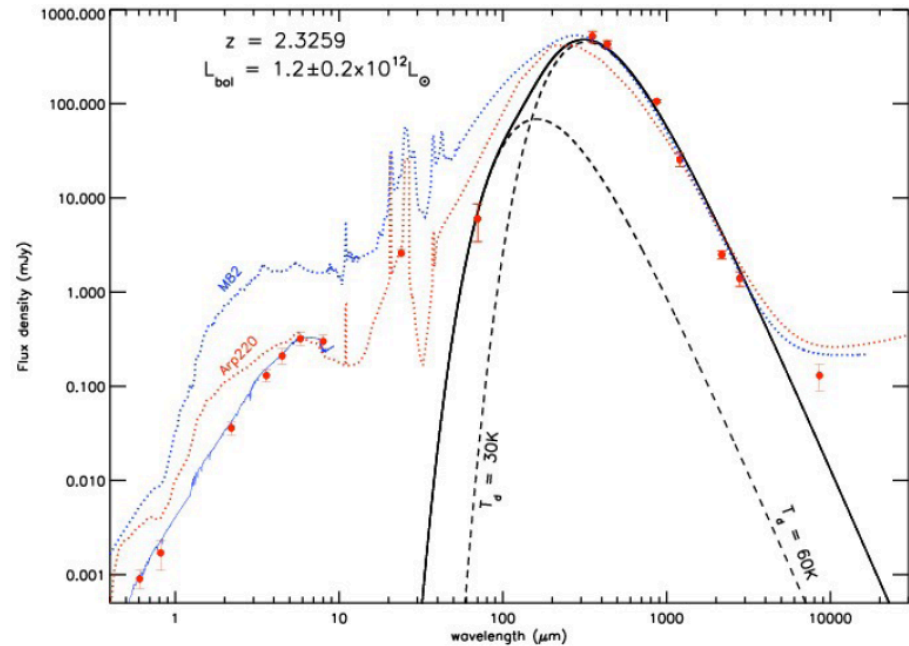


ρ Oph A



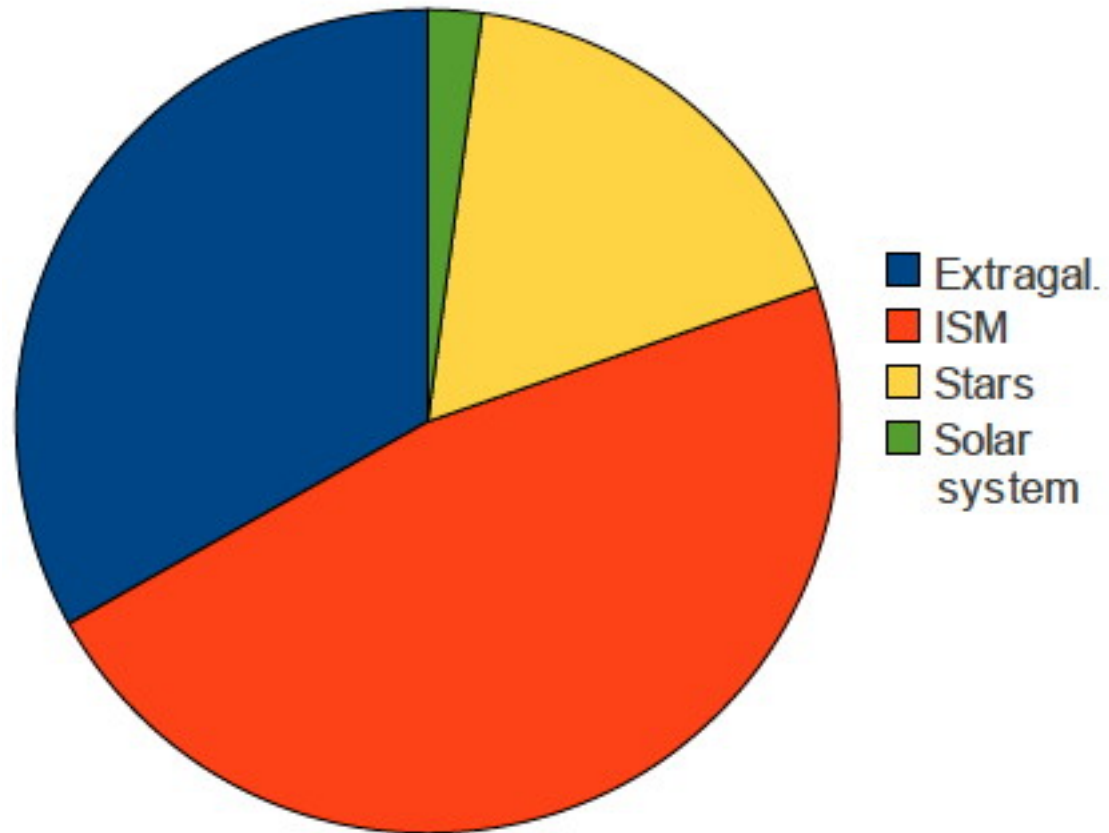
Detection of interstellar HOOH. Bergman et al. 2011. A&A 531, L8

Star formation in high-z sub-mm galaxies

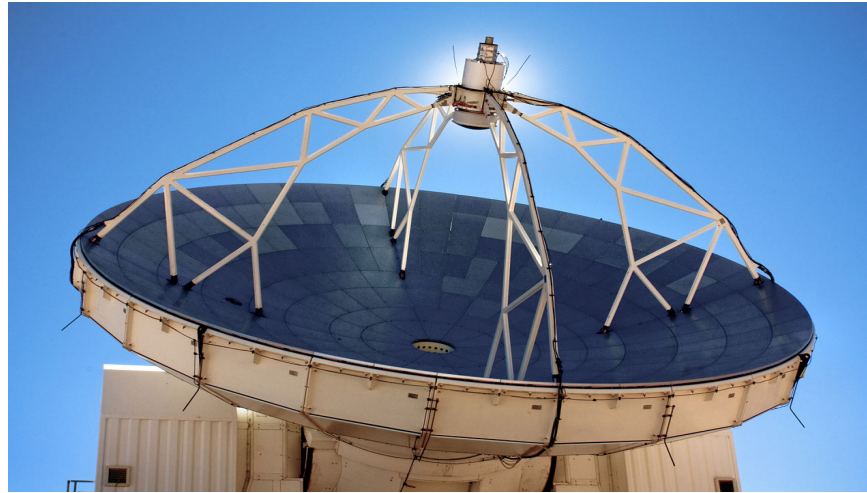


“The Eyelash” Swinbank et al. 2010. Nature 464, 733

Science Categories



Practicalities



APEX is a collaboration

Max-Planck-Institut
für
Radioastronomie

45%



24%

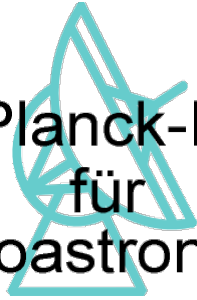


21%



10%

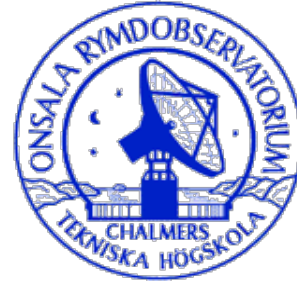
Max-Planck-Institut
für
Radioastronomie



45%



24%



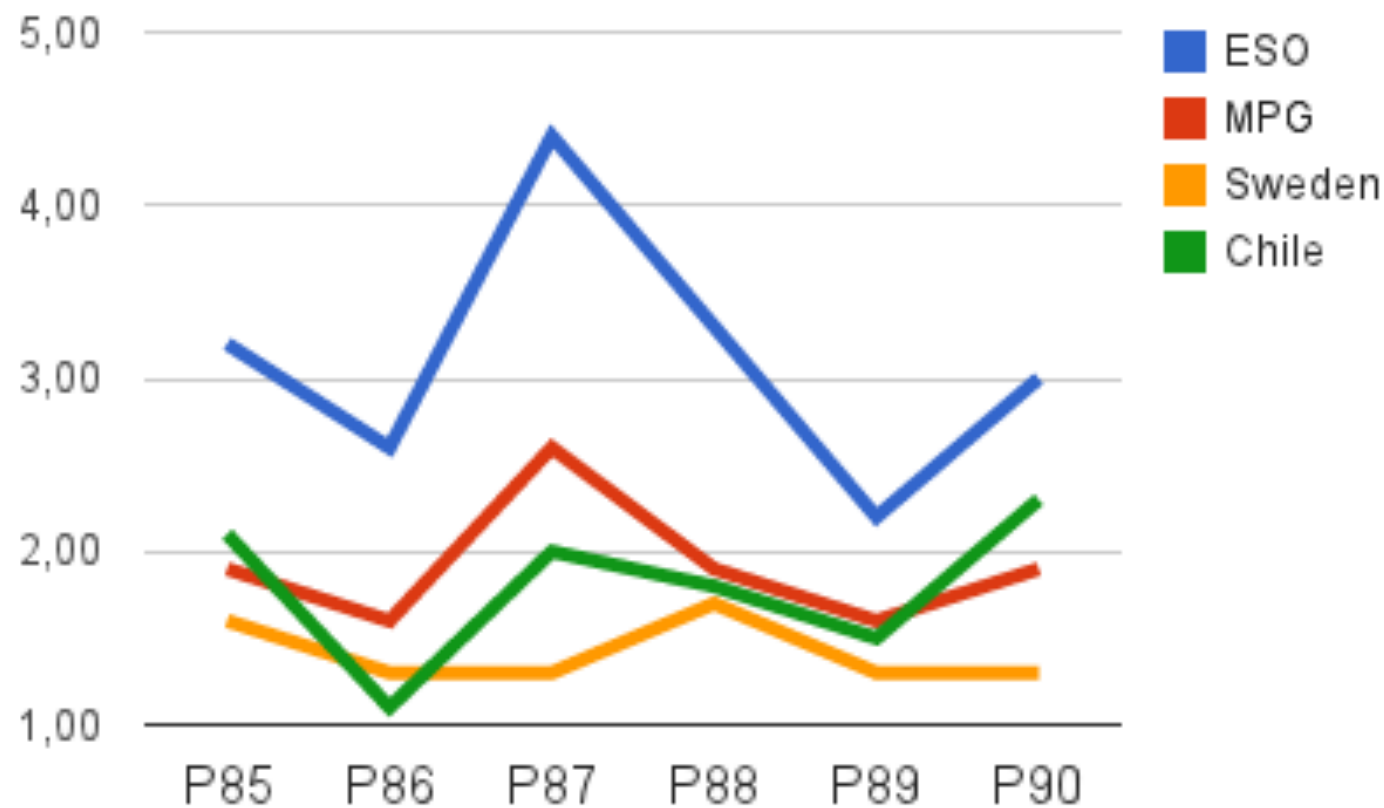
21%



10%

Call	Feb / Aug	Mar / Sep	Apr / Oct	Apr / Oct
Who	Germany	ESO	Open	Chile
Project Scientist	F. Wyrowski	C. de Breuck	P. Bergman	R. Franco

Oversubscription (2010 - 2012)



Getting APEX archival data



1 year



ESO archive

Use APEX specific form!

HELP!

1. <http://www.apex-telescope.org/>
2. Project scientists
3. APEX astronomers

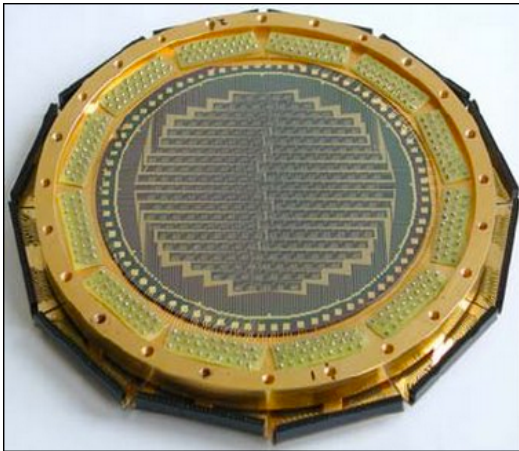




Thank you!



LABOCA



Technical description:

Siringo et al. 2009 A&A, 497, 945

- Array of 295 bolometers (~ 215 still “alive”)
 - Broad band: 345 ± 60 GHz ($870 \pm 150 \mu\text{m}$)
 - HPBW: 18.6 arcsec
 - FOV: 11×11 arcmin²
 - NEFD $\sim 60 - 80$ mJy / sqrt(s)
 - Mapping and photometry modes
-
- Mapping: Spiral, spiral raster, on-the-fly maps. Compact to extended.
 - Photometry mode (wobbler): Only 1 bolometer used: Faint sources
 - Mapping speed: ~ 9 h for 1 deg^2 down to RMS=20 mJy/beam (pwv=1mm)
Photometry: ~ 40 min to get down to RMS = 5 mJy (pwv=1mm)